Universidad Zaragoza

Academic Year/course: 2023/24

69717 - Computer Vision

Syllabus Information

Academic year: 2023/24
Subject: 69717 - Computer Vision
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 633 - Master's Degree in Biomedical Engineering
ECTS: 3.0
Year: 1
Semester: Second semester
Subject type: Optional
Module:

1. General information

The objective of the subject is the computerized perception from images obtained by cameras. Vision has proven applicability in motion capture and analysis, biometrics, and three-dimensional measurement from images and sequences, as well as in robotics and augmented reality. This has a growing application in the biomedical field due to the ease of image acquisition and storage, and the generalization of endoscopic access.

https://www.un.org/sustainabledevelopment/es/)These approaches and objectives are aligned with some of the Sustainable Development Goals, SDGs, of the 2030 Agenda (https://www.un.org/sustainabledevelopment/es/) and certain specific targets, so that the acquisition of the learning results of the subject provides training and competence to the student to contribute to some extent to the achievement of Objective 3.d of Goal 3.

2. Learning results

1. To understand the fundamentals of image acquisition and training, feature detection and robust matching, 3D vision geometry, image alignment, calibration, structure and motion in image sequences.

2. To be skilled in the implementation of basic algorithms for perception with vision, and in the handling of standard software in computer vision and three-dimensional estimation.

3. To be skilled in the design and implementation of simple applications combining basic computer vision algorithms.

4. To be able to self-learn by reading research articles, where the latest advances in the field of computer vision are presented.

5. To be skilled in oral and written communication of computer vision based systems, including their description and experimental evaluation.

3. Syllabus

The contents of the subject are:

1. Image acquisition and formation
2. Feature detection and matching
3. Feature-based image alignment
4. Structure from motion
5. Simultaneous localization and mapping and augmented reality
6. Visual recognition

The program of practical sessions/problems is:

1. Photogrammetric reconstruction
2. Uncalibrated geometry and robust matching
3. Classification with visual characteristics
4. Structure and motion and augmented reality inserts

4. Academic activities

- **Master classes (20 hours)**. Presentation by the teachers.
- **Problem solving (5 hours)**. Analysis and solving of practical cases.
- **Laboratory practices (5 hours)**. Practical exercises programming on a computer.
- **Practical work (12 hours)**. Selection and reading of a scientific article on computer vision related to biomedical engineering and preparation of a presentation where the student will present the article.
- **Personal study (30 hours)**. Study of the contents taught in lectures, writing of the report corresponding to the

practice/problem selected by the student.

- **Assessment tests (3 hours)**. Written test and presentation of a scientific article.

5. Assessment system

E1 (40%) Short exam of short questions or conceptual exercises. Focused on the basic contents of the subject developed in class and practices. The student will be able to use the agreed bibliographic material. This activity assesses learning results 1 and 5.

E2 (40%) Performance of the proposed laboratory practices. Each student selects a practice or problem seen in class in which they has a special interest. They must prepare a written report with a maximum length of 5 pages with the structure of a scientific article for the selected practice/problem. This activity will mainly assess learning results 2, 3 and 5.

E3 (20%) Oral defence of a research paper in the dedicated session. The default work will consist of the presentation of a relevant paper selected from recent scientific literature. The defence of a research work related to the subject may also be considered. This activity will mainly assess learning results 4 and 5.

Students may also pass the subject by means of a global test carried out on the day indicated by the centre, passing the same tests as in the continuous evaluation mentioned above.